(12) UK Patent Application (19) GB (11) 2 175 199 A

(43) Application published 26 Nov 1986

(21) Application No 8610022

(22) Date of filing 24 Apr 1986

(30) Priority data

(31) 734130 (32) 15 May 1985 (33) US

(51) INT CL[4]
A47B 37/00 B01L 9/02

(52) Domestic classification (Edition H)
A4L 1006 104 119 304 AAJ
B1X 1
F2H 18
U1S 1210 2404 A4L B1X F2H

(56) Documents cited
GB 1270309

(58) Field of search
A4L
B1X
Selected US specifications from IPC sub-classes A47B B01L G02J

(71) Applicant
Technical Manufacturing Corporation
(USA—Massachusetts),
15 Centennial Drive, Peabody, Massachusetts 01960,
United States of America

(72) Inventor
Ulf B. Heide

(74) Agent and/or address for service
Brookes & Martin, High Holborn House, 52/54 High
Holborn, London WC1V 6SE

(54) Honeycomb tabletop

(57) A honeycomb tabletop (12) is described for use with either a vibration isolation system or a rigid support stand. The tabletop (12) has an upper skin (16), a lower skin (18), a connecting side wall, and a honeycomb core. Additional stiffening members and structural damping treatment may also be incorporated within the honeycomb core. The upper skin (16) of the tabletop (12) has a plurality of tapped holes (20) for mounting equipment. Each hole (20) is sealed off from the interior (22) of the tabletop (12) by a closed cavity enclosure (24), which is secured to the underside of the upper skin (16) in registration with that hole. The cavity enclosures (24) keep residue and contaminants from passing to the interior (22) of the tabletop (12), and facilitate cleaning of the tabletop. The enclosures (24) are not subjected to any loads during use of the tapped holes (20) in the upper skin (16). The lower skin (18) may optionally be perforated to prevent internal pressure build-up.

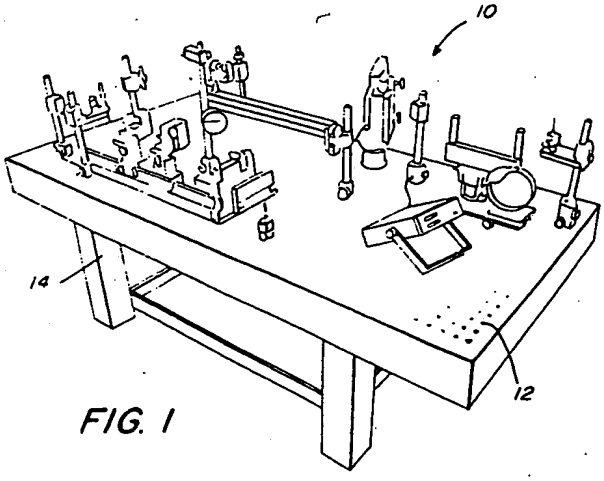

FIG. 1

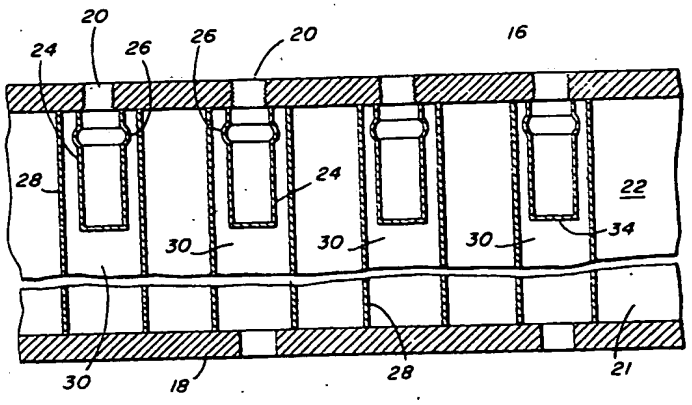

FIG. 2

GB 2 175 199 A

2175199

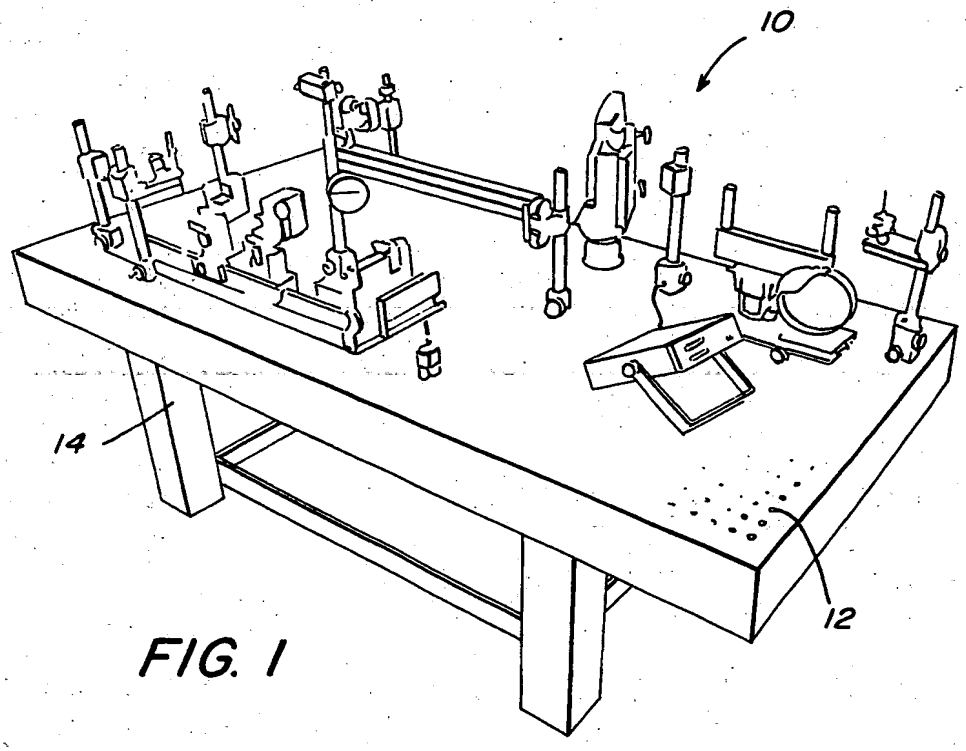

FIG. 1

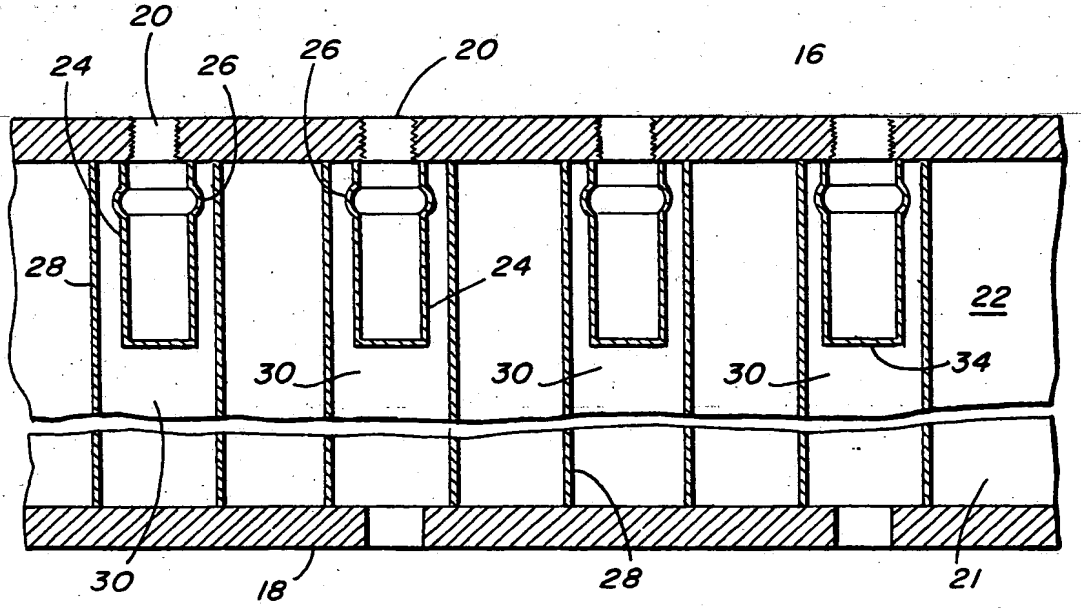

FIG. 2

2175199

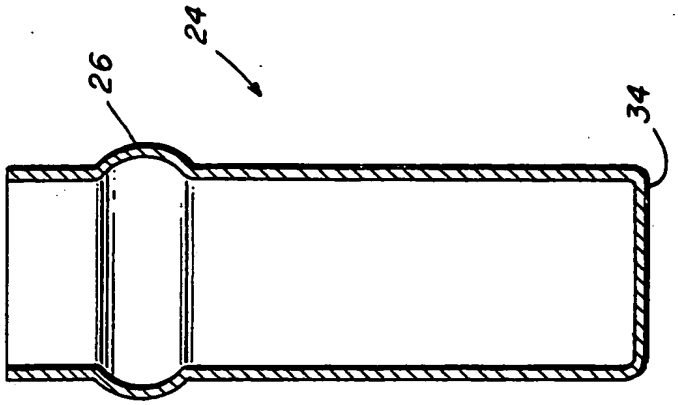

FIG. 4

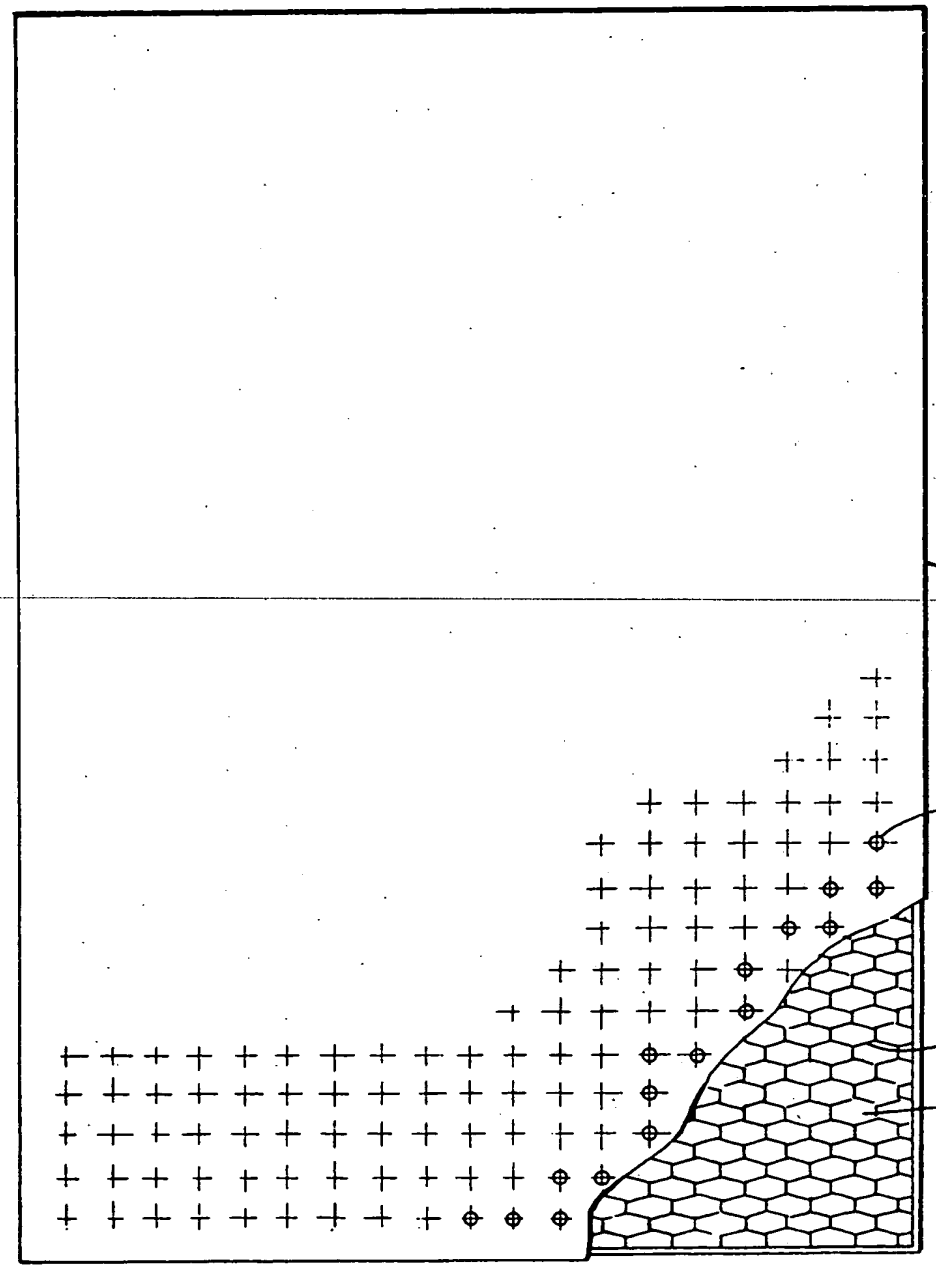

FIG. 3

SPECIFICATION

H neyc mb tabletop

This invention relates to a laboratory table, and in particular to a honeycomb tabletop for use in supporting precision laboratory equipment.

Vibration isolation tables, which are used for supporting highly sensitive equipment (such as optical and analytical devices) on a substantially vibration free surface are well known. Such systems generally include a tabletop, which comprises metallic upper and lower skins bonded to a honeycomb core, and a connecting side wall. The upper skin of the tabletop typically contains a plurality of holes (usually drilled and tapped), which are used for securing equipment upon the tabletop surface. A honeycomb core, with or without additional stiffening or damping components, maintains a rigid separation between the skins, and so ensures the structural integrity of the top. Such a tabletop is commonly referred to as a honeycomb tabletop, and is often supported by a vibration isolation system. A vibration isolation system which can be used with such a table is the GIMBAL PISTON (RTM) isolation system described in U.S. Patent Specification No. 4 360 184.

A honeycomb tabletop is an efficient structure for providing an array of tapped holes, while also meeting the needs of flatness (for example ±.005 inch), magnetic permeability for optional use of magnetic chucks, and reasonable weight.

A disadvantage of known honeycomb tabletops is that drilling through and then tapping the rather thin upper skin (1/8" or 3/16" typically) of such a table results in the tapped holes being backed by large cavities extending full depth of the table. Moreover, in processing the top, cutting or tapping oils must be used, leaving residues in the table that are incompatible with clean opical surfaces, clean room processes, and the like. The alternative to tapping, that is to press in an open or closed threaed insert, is less desirable, because of the likelihood that the threaded insert will loosen after repeated screw installations.

In addition to the contaminants encountered in the processing of the tabletop, the tapped holes provide an opening through which liquid (or other debris) spilled upon the table surface may pass into the interior. Such spillage may pass laterally from one honeycomb cell to another, and will obviously contaminate the interior of the table. The tabletop cannot be thoroughly cleaned, since the bonded table cannot be disassembled, and contamination can spread via vapours and seepage to a clean room atmosphere.

The aim of the invention is to provide a honeycomb tabletop which is constructed in such a way that contaminants and spillage may be easily contained, and prevented from entering the interior of the tabletop. Cleanup will be made easier and there will be a greatly reduced risk of serious contamination.

The present invention provides a honeycomb tabletop comprising a stiffened and damped table surface having an upper skin, a lower skin and a side wall joining the upper and lower skins, the upper skin being provided with a plurality of tapped holes, and the upper and lower skins being maintained in spaced apart relationship, wherein a plurality of closed-cavity enclosures are affixed to the underside of the upper skin, in registration with the tapped holes, to seal off the top surface of the upper skin from the interior of the tabletop.

Thus, the invention provides a honeycomb tabletop for use with or without a vibration isolation system, the tabletop being constructed in such a way that processing contaminants may be removed from the system during the manufacturing process. Moreover, the invention provides a tabletop wherein spillage may be easily cleaned from the table surface and spills will not enter the interior portion of the table.

Thus, a honeycomb tabletop is formed wherein the holes are tapped in the upper skin. The skin is then cleaned. Subsequently, elongated cavity enclosures of minimal volume are secured to the underside of the upper skin, each in registration with a tapped hole. With such cavity enclosures in place beneath each tapped hole, the table surface has the distinct advantage of containing any spillage which may occur with, for example, the use of laser cooling liquid, dyes, and the like. In the event of a spill, the liquid will not enter the interior portion of the table. Rather, it will be confined to the table surface and the shallow cavity enclosures. As a result, cleaning can be effectively accomplished by a combination of wiping the table surface and applying suction to the small enclosures. The enclosures must be affixed securely and permanently, for example by discharge welding and/or epoxy adhesive, and must be put in place on the back of the upper skin before the honeycomb table is layed up with its various components. These cavity enclosures will not become loose, because they are not subjected to any loads resulting from normal use of the tapped holes. The fixed cavity enclosure array further affects table construction because the honeycomb cells must then fit around the enclosures. This is preferable to the potential damage that occurs to the core when conventional drilling and tapping occur. Further, the entire upper skin is processed and cleaned before lamination assembly, leaving a clean, oil and chip-free upper skin.

The invention also provides a method of assembling a honeycomb tabletop, the method comprising the steps of drilling and tapping mounting holes in the upper skin, cleaning the upper skin, securing cavity enclosures to the underside of the upper skin, each of the enclosures being secured in registration with a respective mounting hole in a fluid-tight manner, and joining a lower skin to the upper skin in spaced apart relationship to form a honeycomb tabletop.

A honeycomb tabletop constructed in accordance with the invention will now be described, by way of example, with reference to the accompanying drawings, in which:—

Fig. 1 is a perspective view of a vibration isolation system provided with the honeycomb tabletop;

Fig. 2 is a side sectional view of the tabletop of Fig. 1;

Fig. 3 is a plan view of the top surface and interior portion of the tabletop; and

Fig. 4 is a side view of a closed cavity enclosure of the tabletop.

Referring to the drawings, Fig. 1 shows a vibration isolation table 10, which is used to support laboratory equipment. The table 10 consists of a rigid honeycomb tabletop 12, and a supporting vibration isolation system 14.

Referring to Fig. 2, the tabletop 12 includes an upper skin 16 and a lower skin 18. The upper skin 16 has a plurality of tapped holes 20 used for mounting equipment upon the tabletop 12. The lower skin 18 defines, together with the upper skin 16, an interior cavity 22. A plurality of metallic vertical members 28 are provided within the interior cavity 22, the vertical members defining honeycomb cells 30 (see Fig. 3). Additional internal damping material (not shown) may be incorporated, to aid in minimising the vibrational products of normal tabletop flexural modes, and other induced vibrations. As shown in Fig. 2, the lower skin 18 is formed with perforations to prevent the build-up of internal pressure.

Cavity enclosures 24 are secured, usually by welding, to the interior surface of the upper skin 16. Each of the enclosures 24 has a closed bottom portion 34, which prevents any liquid (or other contaminant) from entering the interior portion of the table 10. The tapped holes 20 and the enclosures 24 are located so as to ensure that each of the enclosures 24 is situated substantially within the middle of a respective honeycomb cell 30. Each enclosure 24 has a shoulder portion 26 at its upper end, the shoulder portions being positioned just below the upper skin 16, so as to prevent the metallic members 28 from contacting a weld bead 32 which secures the enclosures to the upper skin.

As shown in Fig. 4, each enclosure 24 is an elongate member made of metal or plastics material. Each enclosure 24 is dimensioned so as to have a relatively low volume. Ideally, each enclosure 24 should be deep enough to allow some variation as to the depth to which a screw is seated, and its width should generally be slightly greater than the width of the screw.

In order to assemble the cavity enclosures 24 in the tabletop 12, mounting holes are first drilled and tapped in the upper skin 16. The upper skin 16 is then cleaned. This is followed by the step of securing the enclosures 24 to the underside of the upper skin 16, in registration with each tapped hole, by a welding process (or by any other method which will ensure permanent attachment). After thoroughly cleaning, to leave an oil and dirt free surface, the upper skin 16 (along with the attached enclosures 24) is coated with a polymeric adhesive/sealant, such as epoxy or urethane. The metallic members 28 are then pressed to the underside of the upper skin 16. The sealant acts to ensure permanent attachment of the inserts to the upper skin 16. A polymeric coating is then applied to the lower skin 18 which is joined to the members 28.

In an alternative arrangement, the table surface may be further stiffened by adding horizontal stiffener plates to the internal damping system. These stiffener plates run vertically with the members 28, and act to subdivide further the cells 30 defined by the members 28.

The cavity enclosures 24 may be adapted for use with any vibration isolation table system, or any other table or apparatus having a perforated surface where it is essential that liquid (or other forms of contaminant) be prevented from penetrating a top surface, and entering an interior portion. Ideally, the cavity enclosures are used to close off tapped holes in the upper skin of a tabletop. The enclosures prevent any debris produced during manufacture, for example tapping oils and metal filings, and contaminants spilled while performing work on the table surface, from entering the interior of the table. In the event that anything is spilled after the enclosures are in place, such a spill may be easily cleaned, by simply wiping the table surface clean, and applying a suction to remove spillage from the cavities.

CLAIMS

1. A honeycomb tabletop comprising a stiffened and damped table surface having an upper skin, a lower skin and a side wall joining the upper and lower skins, the upper skin being provided with a plurality of tapped holes, and the upper and lower skins being maintained in spaced apart relationship, wherein a plurality of closed-cavity enclosures are affixed to the underside of the upper skin, in registration with the tapped holes, to seal off the top surface of the upper skin from the interior of the tabletop.

2. A tabletop as claimed in claim 1, wherein each of the enclosures has a shoulder intermediate the ends thereof.

3. A tabletop as claimed in claim 1 or claim 2, wherein the upper and lower skins are maintained in spaced apart relationship by a plurality of plates disposed between the upper and lower skins, said plates defining a plurality of vertically-orientated honeycomb cells.

4. A tabletop as claimed in claim 3, wherein each enclosure is received within a respective cell.

5. A tabletop as claimed in any one of claims 1 to 4, further comprising means for securing the enclosures to the upper skin in a fluid-tight manner.

6. A tabletop as claimed in claim 5, wherein the enclosures are welded to the upper skin.

7. A tabletop as claimed in claim 5 or claim 6, further comprising a seal-type coating on the underside of the upper skin.

8. A tabletop as claimed in any one of claims 1 to 7, wherein the lower skin is perforated.

9. A honeycomb tabletop substantially as hereinbefore described with reference to, and as illustrated by, the accompanying drawings.

10. A method of assembling a honeycomb tabletop, the method comprising the steps of drilling and tapping mounting holes in the upper skin, cleaning the upper skin, securing cavity enclosures to the underside of the upper skin, each of the enclosures being seured in registration with a

respective mounting hole in a fluid-tight manner, and joining a lower skin to the upper skin in spaced apart relationship to form a honeycomb tabletop.

11. A method as claimed in claim 10, further comprising the step of coating the underside of the upper skin with a seal-type coating.

12. A method as claimed in claim 10 or claim 11, further comprising the step of welding the enclosures to the upper skin.

13. A method as claimed in any one of claims 10 to 12, further comprising the step of securing a plurality of spacer members between the upper and lower skins, the spacer members defining honeycomb cells, at least some of said cells receiving enclosures.

14. A method as claimed in any one of claims 1 to 13, further comprising the step of forming perforations in the lower skin.

15. A method of assembling a honeycomb tabletop stubstantially as hereinbefore described with reference to the accompanying drawings.

Printed for Her Majesty's Stationery Office by Courier Press, Leamington Spa, 11/1986. Demand No. 8817356.
Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.

This Page Is Inserted by IFW Operations
and is not a part of the Official Record

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

IMAGES ARE BEST AVAILABLE COPY.

As rescanning documents *will not* correct images, please do not report the images to the Problem Image Mailbox.